A RE-EXAMINATION OF NET MIGRATION IN EUROPEAN COUNTRIES IN THE PERIOD 2002-2011: ESTIMATES BY GENDER, AGE AND REGION OF BIRTH

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1. Introduction

"Western Europe" is one of the most important areas of attraction of migration flows coming from the different regions of the World. Migration flows that have affected the EU15 countries in the first decade of the twenty-first century were of very large size and absolutely unexpected (Sobokta, 2009; Strozza, 2010). Several countries have experienced net immigration truly remarkable and never observed before. In particular, some countries in the EU15 Southern and Northern regions of Europe have become the main destination of international migration inside the European continent (East-West migration) and intercontinental migration (mainly South-North). It has also changed the hierarchy of sending countries and the demographic characteristics of migrants were found to vary according to the areas of origin (observing different migration patterns). Only in recent years, following the economic crisis, there were reductions in inflows and increases in outflows, sometimes with negative net migration (for example in Spain). Currently is it possible to reconstruct the history of international migration that affected the countries of Western Europe in the last decade? Do available statistics provide information on the size of migration flows by origin of migrants and their demographic characteristics?

Among the EU countries the causes of heterogeneity in the data collection systems on international migration are manifold. First of all, the type of source available and used varies from country to country. Although many countries make use of statistics on registrations and cancellations from Population Registers due to change of residence, some countries use statistics on residence permits or other administrative sources, others make use of the information collected in sample surveys. In second place, some countries do not have statistics derived from direct count (data collection) on emigration, in almost every country statistics on emigration are generally underestimated (Salt *et al.*, 1994; Bonifazi and Strozza, 2006). In third place, the phenomenon detected and the target population may vary from one country to another, even when countries have the same source of data,

because of different national rules and definitions adopted (Poulain *et al.*, 2006; Strozza, 2010).

Important progress has been made in recent years as a result of European Regulation No. 862/2007 on "Community statistics on migration and international protection" that prompted European countries to provide more uniform and comparable statistics on international migration disseminated by Eurostat. However there still remain issues of no small importance, which make the statistics available only apparently comparable. In addition, data on past years are of lower quality than the most recent ones.

In order to obtain estimates more reliable and comparable across countries of net migration it has often made use of indirect methods of estimation. Residual estimations of net migration of resident population have already been proposed, based on data gathered by the United Nations or Eurostat or directly on the statistics of individual countries (for example: Fassmann, Münz, 1994; Zlotnik, 1999; Bonifazi, Strozza, 2002; Zimmermann, 2005; Jennissen *et al.*, 2006; Strozza, 2010), coming mainly from the data collected in the census rounds. The method proposed in this article allows to estimate net migration of foreign born population distinguished not only by gender and 5-years age groups but also for macro-region of origin (birth). Its application enables us to achieve assessments of net migration for the 2002-2011 intercensal period relative to the EU15 countries (excluding Germany), Norway and Sweden with the detail of the main demographic characteristics and the macro-region of origin of migrants. It is therefore possible to propose a re-examination of international migration in Western Europe in the first decade of the twenty-first century, according to the final results of the 2010-2011 census round and on the basis of an estimation approach that allows us to have a rich statistical material on net migration.

The structure of the article is as follows: in the second section I describe the data used after introducing the particular method of estimating net migration, emphasizing the limits and benefits of the approach and explaining the assumptions that had to be introduced; in the third section I propose a review of net migration for the 16 countries considered separately by gender; in the fourth section, the net migrations are examined for macro-region of origin of migrants, showing large differences between countries and according to demographic characteristics.

2. Method of estimating net migration, data and assumptions

In order to look at the magnitude, demographic characteristics and origin of international migration flows of the last decade, net migration estimates for the foreign-born population by sex, 5-year age groups and macro-region of birth will

be proposed. In general, residual estimations of total net migration of resident population, without distinction by cohort, have frequently been proposed. In the case of international comparison of net migration by country, as said before, the residual estimations are based on data gathered by the United Nations or Eurostat or directly on the statistics of individual countries (Fassmann, Münz, 1994; Zlotnik, 1999; Bonifazi, Strozza, 2002; Zimmermann, 2005; Jennissen *et al.*, 2006; Bonifazi, 2008; Strozza, 2010), coming mainly from the data collected in the census rounds. More generally, information coming from two successive censuses can be used to estimate net intercensal migration by cohort and sex through forward or backward projection. In the case of forward projection the population at the first census, classified by age and sex, is projected to the second census using survivorship ratios (the complement to one of the prospective probability of dying). The differences between the projected population and that recorded by the second census represent intercensal net migration by cohort, assuming that migration occur before the second census. Backward projection works in the same way, estimating intercensal net migration as a residual, assuming in this case that all migrants occurs just after the first census. A correction factor applied to the results of the forward projection method allows for an estimate of net migration assuming uniform distribution of migration between censuses (Wunsch, Termote, 1978). The method of estimating net migration used here is that proposed by Hill (1987) that has the particularity to refer to the foreign born population and to provide estimates by sex and age groups, rather than for birth-cohorts.

The methodology taken from Hill is based on the equations for general population age distributions developed by Preston and Coale (1982), particularly on a further formulation of Coale (1985). According to Hill (1987), if two subsequent censuses take place at time t_1 and t_2 (from now we consider an interval of 10 years), the foreign born population of any 5-year age groups *a*, *a*+5 at the second enumeration ($_5P2_a$) will be equal to the foreign born population of the same 5-year age group at the first enumeration ($_5P1_a$) plus intercensal entries less intercensal losses. Intercensal entries will consist of people having a^{th} birth days, B(a), plus immigrants ($_5I_a$). Intercensal losses will consist of people having $a+5^{th}$ birth days, B(a+5), plus deaths ($_5D_a$) and plus emigrants ($_5E_a$). For a given 5-year age group, the so-called balancing equation of population change is the following:

$$_5P2_a = {}_5P1_a + B(a) + {}_5I_a - B(a+5) - {}_5E_a - {}_5D_a \quad (1)$$

Net migration ($_5NM_a$), equal to $_5I_a - {}_5E_a$, can be expressed as follow:

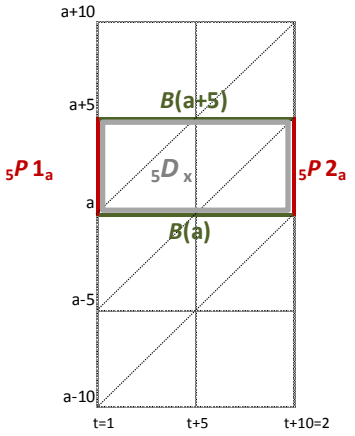
$$_5NM_a = {}_5P2_a - {}_5P1_a + B(a+5) - B(a) + {}_5D_a \quad (2)$$

Thus net migration for a 5-year age group can be estimated from the initial and final numbers of people in the 5-year age group, the number of intercensal deaths, and the number of people entering and leaving the 5-year age group through having birthdays (see Figure 1). The first two terms on the right hand side of equation 2 are directly observed (foreign born populations counted in the two censuses). The fifth term, the deaths, can be estimated by applying a 5-year age-specific mortality rate to an estimate of the average number of people in the 5-year age group during the intercensal period. In other words, the number of deaths can be estimated from the person-years lived in the 5-year age group during the intercensal period multiplied by the 5-year age-specific mortality rate. The person-years lived can in turn be estimated as the geometric average of the initial and final population of the 5-year age group multiplied by the intercensal interval in years. Thus, considering an intercensal interval of 10 years,

$$ {}_5D_a = 10\left[\left({}_5P1_a\right)\left({}_5P2_a\right)\right]^{1/2}\left({}_5m_a\right) $$

where ${}_5m_a$ is the 5-year age-specific mortality rate for the age group a, a+5 for the considered intercensal period.

Figure 1 – *Lexis diagram containing terms on the right hand of equation 2*



The third and the forth terms on the right hand side of equation 2, the numbers of birthdays, are the most complex to evaluate. They are the cost of the advantage of moving from an estimate of net migration by birth-cohort to an estimate by age group (Hill, 1987). In an intercensal interval of 10 years, two 5-years-cohorts, that initially aged *a*-5, *a* and that initially aged *a*-10, *a*-5, plus migrants of the same aged cohorts, contribute all the ath birthdays. The former cohort will provide the birthdays in the first five years of intercensal period, suggesting heavier weighting for ${}_5P1_{a\text{-}5}$ than for ${}_5P2_{a+5}$. The latter cohort, on the other hand, will provide for birthdays the second five years of intercensal period, suggesting heavier weight for ${}_5P2_a$ than for ${}_5P1_{a\text{-}10}$. This becomes even clearer looking at the Lexis diagram (Figure 1) and results in the following formula:

$$ B(a) = \left[\left({}_5P1_{a-5}\right)^{3/4}\left({}_5P2_{a+5}\right)^{1/4}\right] + \left[\left({}_5P1_{a-10}\right)^{1/4}\left({}_5P2_a\right)^{3/4}\right] $$

To synthesize, in the interval between two successive censuses, an assessment of net migration by sex and 5-year age groups for foreign-born population can be obtained by the equation 2 that only requires the availability of data on foreign born population by sex and five-year age group in the first census (${}_5P1_a$) and in the second census (${}_5P2_a$), and the estimated 5-year age-specific mortality rates (${}_5m_a$) referring to the period between the two censuses.

The proposal that we advance here is to make estimates of net migration of foreign-born population not only by sex and age but also separately for macro-regions of birth of the foreign-born population. This further development is possible when the target population is foreign-born people and when it makes use of the estimation method proposed by Hill. This approach allows then to propose a reading of the net migration that is no longer limited only to the countries of destination but also considering the macro-regions of origin of migrants. In this work we will consider the following macro-regions: More Developed Countries (MDCs – including EU15, other Western Europe countries, North America, Oceania, Japan and Israel), EU12 (countries entered in the EU in the 2004 and 2007 enlargement); Eastern Europe, South-East Europe (Balkan countries), North Africa, Other Africa, Western Asia, Other Asia and Latin America.

Before describing in detail the operational solutions adopted, it is firstly necessary to recall some limitations of the proposed approach. The peculiarity of the estimates proposed here is that these concern the only foreign-born population and that they are divided by sex, age groups and even groups of countries of birth (macro-regions of birth). The foreign-born population provides an estimate of the immigrant population (Dumont, Lemaître, 2008), even if this data has to be considered with extreme caution because it also includes the children born abroad of returned national emigrants, that is an important component in countries with a fairly recent significant emigration. Since the objective is to estimate net inter-census migration of the foreign-born population, it can be assumed that the estimates relate almost exclusively to non-nationals.

The period of reference is about 2002-2011, the interval between the last two census rounds. The initial goal was to estimate the 2002-2011 net migration relative to EU15 countries, plus Norway and Switzerland. Data used are those published by Eurostat on its website: a) stock of the foreign-born population by sex, 5-years age group and country/region of birth at 2001 and 2011 census rounds; b) 2007-2012 number of deaths of born-abroad individuals residing in the 17 countries; c) life tables of the resident population in 17 selected countries for the entire period.

First of all it should be stressed that, detailed estimates of net migration (by sex, 5-year age groups and macro-regions of birth) were not computed for Germany due to the lack of information on 2001 foreign born population residing in the country. For other three countries (Ireland, the Netherlands and

Switzerland) it was necessary to use Eurostat data on population calculated at the beginning of 2012, due to the unavailability of 2011 census data on the Eurostat website with the detail required.

The estimate of deaths, made separately for sex, was obtained, in a first approximation, by adopting the same 5-years age-specific mortality rates of the total resident population, taken from the life tables referred to the middle of the intercensal period, for each of the macro-regions of birth of the foreign-born population. The assumption adopted is that immigrants adapt to the conditions of survival of the country of residence. The ratio of total deaths observed for the entire period (2002-2011) and that obtained with the aforesaid procedure of first approximation has served to readjust deaths by 5-year age groups and macro-regions of birth, getting feedbacks of second approximation. The differences in absolute value between the observed deaths and estimated ones were almost always contained. For this reason, it was decided to adopt as final estimate of deaths the average between the first and second approximation evaluations.

3. General results: numbers, rates and sex composition of net migrations

Before examining the results of the estimates, it should be noted that these assessments are obviously conditioned first of all by the level of coverage of the foreign-born population in the two census rounds. Around 2011 nearly 50 million foreign-born persons resided in the 17 selected countries. Higher numbers are registered in Germany (less than 14 million), the United Kingdom (just under 8 million), France (over 7,3 million), Spain (near 5,7 million) and Italy (4,8 million), but the biggest impact of foreign-born on the total resident population is observed, in decreasing order of importance, in Luxembourg (40%), Switzerland (almost 26%), Germany (17.4%), Ireland and Austria (both just under 16%) (Table 1). Resulting estimates for the period 2002-2011 confirmed the significant absolute net immigration of born abroad individuals to Germany (4.3 million), Spain, United Kingdom (both about 3.6 million), Italy (almost 2,7 million) and France (2 million). In the first five positions of net immigration there are the same countries that have the highest stock of foreign born population, though not quite in the same order. It should be noted, however, that Spain and Italy record the highest annual average migration rate equal, respectively, to almost 103 and exactly 82 immigrants every year per 1,000 born-abroad residents. Fairly high rates are also recorded by Northern European countries (in the order Norway, Ireland, Finland and the UK), while all other countries show much lower rates. For Germany, the estimate of net migration is not available with specification by sex, age or macro-region of origin. Therefore, Germany from this time onwards is excluded from the analysis.

Mainly in Norway, net migration is composed of more males than females with a gender significant difference (women are only 46.3%). A slight male prevalence is also observed in net immigration of foreign-born people in Finland, Luxembourg, Switzerland and Spain, substantial gender balance was recorded in the UK, Sweden and Belgium. In the remaining countries women become the majority among net immigrants, especially in Greece (61%), Portugal (58.4%), the Netherlands (57.7%) and Italy (56.8%).

Table 1 – *Stock of foreign-born population around 2011 and estimated 2002-2011 net migration of foreign-born population residing in EU-15 countries, Norway and Switzerland. Absolute values (in thousand), percentages and annual rates (per 1,000 foreign-born population).*

Country of residence	Foreign-born population (around 2011)		Estimated net migration (period 2002-2011)		
	Absolute values (thousand)	% of total population	Absolute values (thousand)	Rates (per 1,000 foreign-born)	% female
Denmark	518	9.3	181	42.2	53.2
Finland	248	4.6	117	63.9	48.3
Ireland [(a)]	726	15.8	345	64.0	52.8
Sweden	1,427	15.1	506	42.3	49.7
United Kingdom	7,993	12.7	3,602	58.2	49.7
Austria	1,316	15.7	402	35.0	53.8
Belgium	1,629	14.8	634	47.4	49.9
France	7,326	11.3	2,003	30.6	53.0
Germany [(b)]	13,895	17.4	4,317	36.2	…
Luxemburg	206	40.2	71	41.5	48.3
The Netherlands [(a)]	1,906	11.4	390	22.2	57.7
Greece	1,286	11.9	217	18.1	60.9
Italy	4,804	8.1	2,688	82.0	56.8
Portugal	872	8.3	253	33.5	58.4
Spain	5,662	12.1	3,609	102.9	48.9
Norway	612	12.3	313	71.7	46.3
Switzerland [(a)]	2,034	25.6	307	15.9	48.8
EU-15	49,814	12.5	19,336	47.8	51.9

Notes: (a) The figure refers to the beginning of 2012 and not the census data. (b) For 2001 it is available only the number of foreign-born population published by the OECD. The estimated net migration must be seen as an evaluation of large maximum, without distinction by sex, age groups and areas of birth.
Sources: our elaboration from Eurostat data coming from national statistics collected in the 2001 and 2011 census rounds and in continuous recording of deaths.

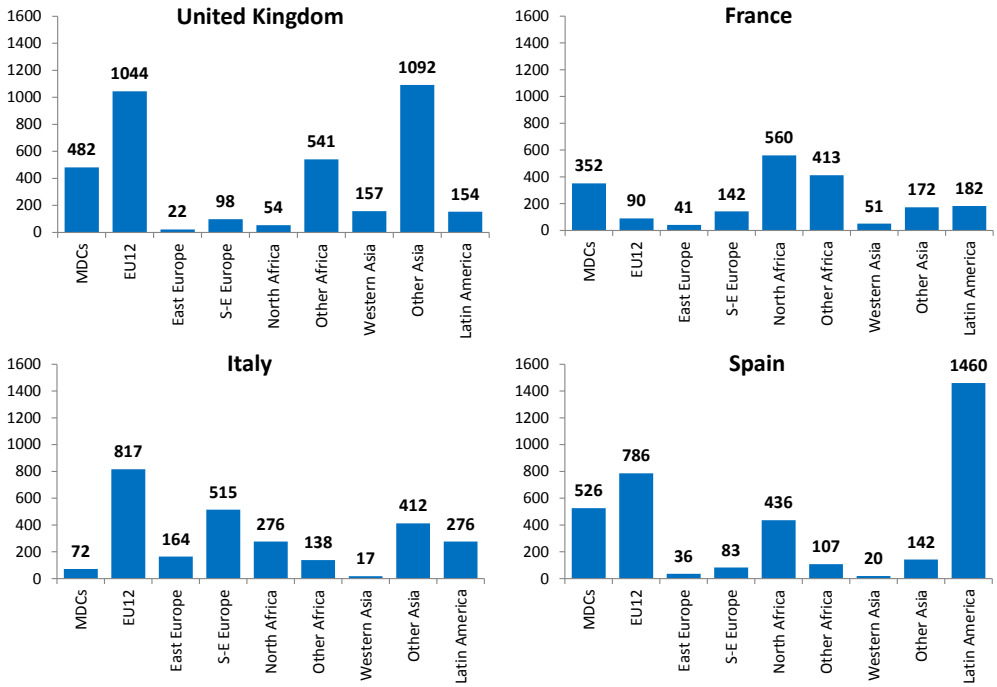
Already these data show significant differences among the receiving countries considered not only for intensity of immigration of foreign born people but also on the basis of some of their demographic characteristics. At this point it is interesting to see

how from one country to another the main areas of origin of immigrants can change and if any relationship between the area of origin and composition by sex exists.

4. Specific results: macro-region of origin, sex and age in net migration

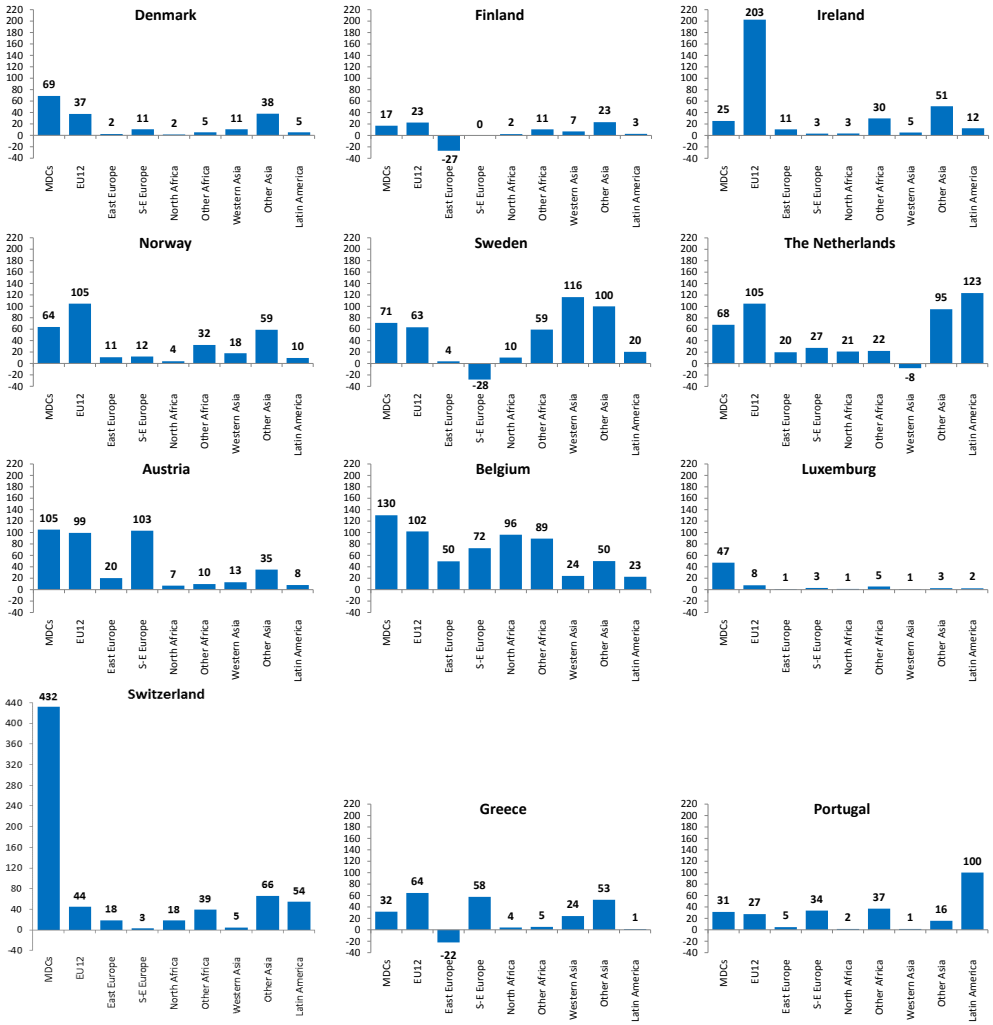
Details by macro-region of birth allows us to note how the 16 selected host countries have an extremely heterogeneous profile based on size, area of origin of immigrants (Figure 2 and 3) and their demographic characteristics (Table 2, Figure 4 and 5). Immigrants born in the new EU countries account for almost a quarter of all 2002-2011 net immigration estimated and their net inflow is particularly large in the United Kingdom (more than one million), Italy and Spain (respectively more and less than 800 thousand), the most important receiving countries in the period.

Figure 1 – *Net migration of foreign born population by macro-region of origin. United Kingdom, France, Italy and Spain, 2002-2011 period. Values in thousand*



Source: see Table 1.

Figure 2 – *Net migration of foreign born population by macro-region of origin. Some EU15 countries plus Norway and Switzerland, 2002-2011 period. Values in thousand.*



Source: see Table 1.

The majority of women in net immigration appears, more or less marked, among people coming from new-EU East European countries, the former Soviet European republics, Latin America and Central and South America (essentially from South-East Asia), as well as the male-dominated in net immigration from Northern Africa and the Middle East (Table 2 and Figure 4).

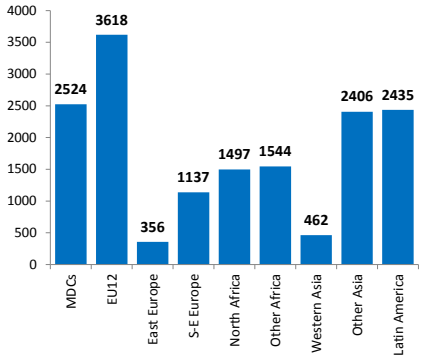
Table 2 – *Percentage of female in 2002-2011 net immigration of foreign-born population residing in EU-15 countries, Norway or Switzerland, by macro-region of origin.*

Country of residence	Macro-region of origin								
	MDCs	EU-12	East Europe	S-E Europe	North Africa	Other Africa	West Asia	Other Asia	Latin Am.
Denmark	53.4	45.6	71.2	50.9	52.8	50.6	48.6	60.9	58.6
Finland	37.5	48.7	…	…	36.8	41.0	38.1	54.7	48.1
Ireland	54.8	51.2	60.6	48.2	43.4	57.4	49.0	54.8	55.7
Sweden	45.0	48.7	72.1	…	42.1	49.5	47.3	55.0	53.8
United Kingdom	49.3	50.7	78.7	49.5	38.9	52.3	39.0	48.6	53.3
Austria	46.5	60.0	56.2	56.0	52.7	47.7	49.8	52.2	57.9
Belgium	50.0	51.5	55.7	46.9	48.6	49.7	36.7	50.5	59.4
France	51.2	55.5	61.1	49.6	50.3	55.0	48.6	57.7	56.8
Luxemburg	44.4	62.3	64.5	60.0	40.9	46.9	36.5	57.4	62.8
Netherlands	52.8	53.0	68.0	55.0	67.1	59.6	…	56.2	55.2
Greece	53.2	67.5	…	90.7	…	39.2	72.0	23.4	64.6
Italy	59.6	60.9	70.8	60.3	46.4	42.2	63.6	44.9	63.7
Portugal	51.7	53.1	…	48.8	45.2	64.6	41.8	43.5	61.3
Spain	42.8	50.4	65.6	53.1	45.6	31.7	49.8	50.0	51.8
Norway	41.8	34.7	63.4	55.8	47.7	49.1	53.9	60.9	59.3
Switzerland	44.1	60.6	70.0	…	46.1	49.6	43.2	58.5	63.6

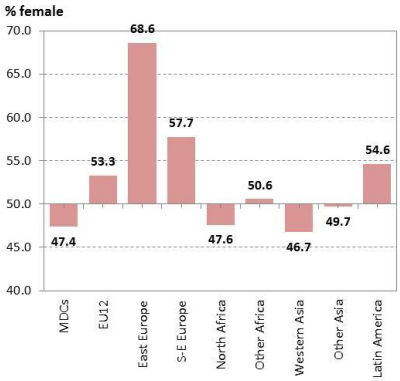
Source: see Table 1.

Figure 4 – *Net migration of foreign born population by macro-region of origin. Total of 16 European countries, 2002-2011 period. Abs. values in thousand and % of female.*

a. Sum of net migration in 16 countries (absolute values in thousand)



b. Percentage of female in the total of 16 countries

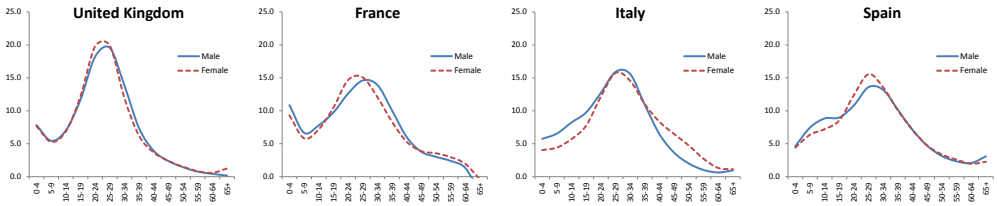


Source: see Table 1.

Net immigration in the UK is clearly younger than that directed to Spain and Italy (Figure 5). More generally, and always with reference to the four countries with the largest net immigration (excluding Germany), at least 3 main patterns can be observed:

a) a significant migration from MDCs to Spain, that is characterized by similar age structures between males and females and by a significant share of old persons (just the opposite in the UK); b) important flows to Italy and Spain from Eastern European countries, mainly composed of females, with very different age structures by sex and a high quota of women aged 35-64 years old; c) significant inflows in Spain and Italy of North African migrants, more likely composed of young (20-34 years old) men.

Figure 5 – *Net migration of foreign born population by 5-year age group and sex. United Kingdom, France, Italy and Spain, 2002-2011 period. Percentage values.*



Source: see Table 1.

Estimates obtained, reported and discussed here briefly, lead to a better understanding of the origins and demographic characteristics of net migration recorded in the past decade in the countries of Western Europe, contributing to the historical reconstruction of what happened in a period of such intense migratory movements.

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SUMMARY

A re-examination of net migration in European countries in the period 2002-2011: estimates by gender, age and region of birth

In order to look at the magnitude, demographic characteristics and origin of international migration flows of the last decade, net migration of the foreign born population by sex, age and macro-region of birth were estimated for EU15 countries, plus Norway and Switzerland, using the methodology developed by Hill (1987).

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